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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/928,257	08/10/2001	Baining Guo	MS1-952US	5744

22801 7590 08/29/2003

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EXAMINER	
NGUYEN, KIMBINH T	

ART UNIT	PAPER NUMBER
2671	9

DATE MAILED: 08/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/928,257	GUO ET AL.
	Examiner	Art Unit
	Kimbinh T. Nguyen	2671

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 August 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 August 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Claims 1-50 are pending in the application.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsujido et al. (5,471,565) in view of Takahashi (6,018,423).

Claim 1, Tsujido et al. discloses moving a semitransparent plane (rotating a rotary body or object) including reflection points (point P on an object having a reflection factor R, col. 2, lines 64-65; fig. 3) perpendicular relative to an axis (perpendicular to a rotation axis, col. 3, lines 7-11); rendering an image of reflection points at positions with respect to the axis such that each point maps an elongate, continuous image (displaying picture image with respect to the external line of a cross section which passes through the rotation axis, col. 1, lines 53-63). Tsujido teaches an rotary object having mirror surface (fig. 3) and does not teach a semitransparent plane; however, Takahashi teaches using a semitransparent plane mirror, col. 2, lines 39-40, fig. 23). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the semitransparent plane taught by Takahashi's method into a

method of displaying a rotary body taught by Tsujido's method for obtaining a realistic picture image, because using a semitransparent surface which reflects a ray bundle from the image display device, it would provide a clear image at a wide field angle with substantially no reduction in the brightness of the observation image, and which is extremely small in size and light in weight and hence unlikely to cause the observer to be fatigued (col. 2, lines 52-56).

Claims 2-5, Tsujido et al. discloses reflection points relative to the axis comprises rotating the plane (using rotation axis 1 to rotate body 10 included surfaces 2 and 6, fig. 2), translating the plane with respect to the axis (the brightness of each point on the surface of an object (reflection points) can be determined from the inclination of the external line and the angle with respect to one's line of vision, the translation or moving between the inclination of the external line with respect to one's line of vision (axis x)) and perpendicular with respect to the axis (col. 3, lines 7-16); rendering a 3D model from a combination of images (col. 2, lines 55-57).

4. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsujido et al. (5,471,565) in view of Takahashi (6,018,423) and further in view of Groller et al. "Modeling and Visualization of Knitwear", IEEE 1995, pages 302-310.

Claims 6 and 7, the rationale provided in the rejection of claim 1 is incorporated herein. In addition, Tsujido does not teach define a 3D surface of a macrostructure and microstructure; however, Groller teaches rendering a macrostructure of woven materials having a fine microstructure (see section "Introduction", page 302); a computer readable-media comprising computer-executable instructions (C++ and CAD program,

see section "Results and Images, page 306). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the macrostructure taught by Groller into a method of displaying a rotary body taught by Tsujido's method for rendering 3D surface of textile materials, because applying a 3D surface of macrostructure having repetitive structure of microstructure of the material, it would allow a close-up inspection of the model (see section "Instruction", page 302).

5. Claims 8-32, 36-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Groller et al. "Modeling and Visualization of Knitwear", IEEE 1995, pages 302-310 in view of Westin et al. "Predicting Reflectance Functions from Complex Surfaces", ACM published 1992.

Claim 8, Groller discloses generating a macrostructure for a 3D object (yarn structure) defined by axes (figs 4, 5, 6); applying a semitransparent microstructure, defined by reflection points to the macrostructure by moving (rotating) the plane of reflection points (points P0-P6; fig. 5) respect to axis to yield a 3D model (see section II and III, pages 302-305). Groller teaches an anisotropic lighting model consisting of specular reflection and does not teach transparent model; however, Westin et al. teaches "to model microgeometries that include transparent materials (see section 4.3 "Specular Transmission"). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of modeling the microgeometries that include transparent materials taught by Westin into knitwear modeling of Groller's teaching for modeling textile materials, because using transparent

medium material, it would preserve energy flux density and radiance of specular reflection transmission (see section 4.3).

Claims 9, 11 and 12, the rationale provide in the rejection of claims 4, 5 and 7 is incorporated herein.

Claim 10, Groller discloses the microstructure simulates a cross section consisting of: human hair; fur; yarn (see section "Introduction", page 302).

Claims 13-17, the rationale provided in the rejection of claim 8 is incorporated here in. In, addition, Groller teaches applying a stitch pattern to each axis (simple knitwear patterns are made up of only two type of loops (R-loop or plain stitch and L-loop or reverse stitch, see section "A simple knitwear model", page 302); applying a lumislice (cross sectional slice of yarn) to the stitch pattern (translating, rotating) to yield a 3D knitwear model; combination of images of the lumislice (cross section slice of yarn); 3D knitwear model including "density of scattered spots" (see section III and IV, pages 304-306; fig. 7); a computer-readable media (CAD program PYTHA).

Claims 18-26, the rationale provide in the rejection of claims 13-17 is incorporated herein. In addition, Groller teaches the macrostructure being defined by axes connecting of control points which situated at an intersection of axes (a large number of points are generated. These points are taken to define a footprint, see the left column of page 305); the macrostructure yarn is based on a color pattern (consists of different colored subyarn, see the right column of page 306); the 3D surface being partitioned into quadrilaterals corresponding to the stitch pattern (see section IV, pages 305-306; fig. 9); connecting key points of the quadrilateral with curved segments to yield

a stitch loop (R-loop and L-loop, see section II, pages 302-304); introducing irregularities in stitch pattern of macrostructure (reverse stitch, see the bottom of page 302); interactions among the reflection points (small-scale interaction, the interaction between the knitting yarn and loops of stitch) at different locations (row by row of knitwear pattern) on the macrostructure (see section II, pages 302-303).

Claim 27, Groller et al. discloses moving voxels contained within parallel opposing planes with respect to an axis that is perpendicular to the parallel opposing planes, each voxel being semitransparent and having a reflectance factor and reflection points having a density (volume densities with anisotropic lighting behavior consisting of specular reflection, internal reflection, and diffuse reflection (see section I "Introduction", page 302); rendering image of voxels (rendering the knitwear model) with respect to the axis. Groller does not teach transparent model; however, Westin et al. teaches "to model microgeometries that include transparent materials (see section 4.3 "Specular Transmission"). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of modeling the microgeometries that include transparent materials taught by Westin into knitwear modeling of Groller's teaching for modeling textile materials, because using transparent medium material, it would preserve energy flux density and radiance of specular reflection transmission (see section 4.3).

Claims 28-32, the rationale provide in the rejection of claims 2-6 is incorporated herein.

Claim 36, the rationale provided in the rejection of claim 7 is incorporated herein.

Claim 37, the rationale provide in the rejection of claim 18 is incorporated herein. In addition, Groller et al. teaches rendering a 3D knitwear model (rendering of knitted fabrics is done through direct volume visualization, see section IV "Efficient rendering of knitwear structures, page 305).

Claims 38-44, the rationale provide in the rejection of claims 19-24 and 26 is incorporated herein.

Claim 45, Groller et al. discloses the claimed features (see pages 302-310); Groller does not teach semitransparent material; however, Westin et al. teaches "to model microgeometries that include transparent materials (see section 4.3 "Specular Transmission"). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of modeling the microgeometries that include transparent materials taught by Westin into knitwear modeling of Groller's teaching for modeling textile materials, because using transparent medium material, it would preserve energy flux density and radiance of specular reflection transmission (see section 4.3).

Claim 46, the rationale provided in the rejection of claim 19 is incorporated herein.

6. Claims 33, 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Groller et al. "Modeling and Visualization of Knitwear", IEEE 1995, pages 302-310 in view of Westin et al. "Predicting Reflectance Functions from Complex Surfaces", ACM published 1992 and further in view of Neyret "Modeling, Animating, and Rendering Complex Scene Using Volumetric Textures", IEEE, 1998, pages 55-70).

Claim 33, Groller does not teach voxel reflectance function; however, Neyret teaches "each voxel of the reference volume contains a key feature which controls the reflectance function" (see abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the voxel reflectance function taught by Neyret into the modeling and visualization of knitwear of Groller's teaching for rendering a knitwear model, because it allows for ray-tracing of highly complex scenes with very few aliasing artifacts (se abstract).

Claims 47 and 48, Groller et al. teaches lighting model (lighting conditions, color, opacity, texture map (shadow map) (see section I and V); a cross-sectional slice of yarn is divided into voxel (see fig. 9); Groller does not teach voxel reflectance function; however, Neyret teaches "each voxel of the reference volume contains a key feature which controls the reflectance function" (see abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the voxel reflectance function taught by Neyret into the modeling and visualization of knitwear of Groller's teaching for rendering a knitwear model, because it allows for ray-tracing of highly complex scenes with very few aliasing artifacts (se abstract).

7. Claims 34, 35 and 49, 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Groller et al. "Modeling and Visualization of Knitwear", IEEE 1995, pages 302-310 in view of Westin et al. "Predicting Reflectance Functions from Complex Surfaces", ACM published 1992 and further in view of Neyret "Modeling, Animating, and Rendering Complex Scene Using Volumetric Textures", IEEE, 1998, pages 55-70) and

Hanrahan "Reflection from Layered Surfaces due to Subsurface Scattering", ACM 1993, pages 165-174.

Claims 34, 35, 49 and 50, Hanrahan et al. discloses the VRF represents the brightness of a voxel (scattering) viewed from direction $V(\theta,\Phi)$ by a unit intensity light from direction $L(\theta,\Phi)$ the directional increment for the longitude angle are $\theta \in [0,2\pi]$ (the horizontal axis of fig. 1), the altitude angle (parallel surface) $\Phi \in [-\pi/2, \pi/2]$ (see section 2, pages 166-167). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the scattering from complex microscale geometries taught by Hanrahan into modeling and visualization of knitwear of Groller's method for rendering a knitwear model, because the reflection of light from multiple scattering, it would provide qualitatively explained for diffuse reflection of volume materials (see section 1 "Motivation").

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Buzak (4,670,744) discloses light reflecting 3D display system.
- Heirich (6,359,618) discloses using irradiance textures for photorealistic image generation.
- Voorhiers et al. (5,704,024) discloses method and apparatus for generating reflection vectors on an environment map.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Kimbinh Nguyen** whose telephone number is **(703) 305-9683**. The examiner can normally be reached **(Monday- Thursday from 7:00 AM to 4:30 PM and alternate Fridays from 7:00 AM to 3:30 PM)**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

Or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Part II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

August 25, 2003

Kimbinh Nguyen

Kimbinh Nguyen

Patent Examiner AU 2671